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FOREST RESOURCES OF NORTH GEORGIA

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A Progress Report by

THE SOUTHERN FOREST SURVEY

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FOREWORD

The nation-wide Forest Survey, being conducted by the United States Forest Service, was authorized by the McSweeney-McNary Forest Research Act of 1928. Its five-fold object is: (1) to make an inventory of the extent, location, and condition of forest land and the present supply of timber and other forest products, (2) to ascertain the rate at which this supply is being increased through growth, (3) to determine the rate at which this supply is being diminished through industrial and local use, windfall, fire, and disease, (4) to determine the present requirement and the probable future trend in the requirement for timber and other forest products, and (5) to correlate these findings with existing and anticipated economic conditions, in order that policies may be formulated for the effective use of land suitable for forest production.

This release is based on a field survey made Oct. 12, 1935, to Dec. 21, 1935, and three field canvasses of forest industrial plants to determine forest drain, the last of which was made during June 1937. It should be regarded only as a progress report, since it contains Forest Survey data that will be included in complete reports to be published later and that, although considered reliable, are subject to correction or amplification as the work of computation proceeds. Item 4 above, which is being studied on a national basis, is not discussed in this report.

In the presentation of these survey data, it is to be noted that owing to the sampling method used in collecting them, the greater the number of samples in any given classification the more accurate are the data for that classification. Hence classes that are of infrequent occurrence and relatively small in quantity generally cannot be determined with as high a degree of accuracy as classes that occur more frequently and in substantially greater quantities. Small tabular items are to be taken as showing, not the exact magnitude of the classes involved, but their relative magnitude in comparison with those of other classes.

In the South, the Forest Survey functions as an activity of the Southern Forest Experiment Station with headquarters at New Orleans, La.

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FOREST RESOURCES OF NORTH GEORGIA

General Description

North Georgia (Forest Survey Unit Georgia No. 5) is an area of over 4 million acres lying in 21 counties, 9 of which are along the northern boundary of the State (fig. 1). An area of broken and diversified topography, its main divisions are the southern extremities of the Blue Ridge Mountains of the Appalachian Mountain Range in the eastern part, and the Valley and Ridge Belt in the western part. Small areas of the upper Piedmont province are found chiefly in the southern tier of counties, and some of the Cumberland Plateau occurs in the northwest part (chiefly in Dade County). The highest point, Brasstown Bald, on the boundary between Union and Towns Counties, is over 4,700 feet above sea level, and the lowest points in the valleys have an elevation of about 600 feet. Approximately two-thirds of this area (table 1) is forested with various hardwoods, and with pines, hemlock, and cedar. Nearly 6 percent of the unit is made up of idle and abandoned cropland. Although agriculture broadly defined includes both farming and forestry, in this report agriculture is used to mean farming, and forestry to mean timber growing and utilization.

Table 1. - Land area classified according to land use, 1936

Land use	Area	Proportion of total area
	Acres	Percent
Forest	2,835,300	66.4
Nonforest:		
Agricultural:		
In cultivation:		
Old cropland	932,100	21.8
New cropland	22,700	.5
Out of cultivation:		
Idle	156,400	3.7
Abandoned	84,400	2.0
Pasture	152,500	3.6
Total agriculture	1,348,100	31.6
Other nonforest	84,100	2.0
Total nonforest	1,432,200	33.6
Total forest and nonforest	4,267,500	100.0

Rome is the largest city (population 22,000 in 1930), but other cities and towns in the area having 2,500 or more are Dalton, Cartersville, Toccoa, Trion, Rossville, Canton, and LaFayette. Also two large cities—Chattanooga, Tenn. and Atlanta, Ga.—are near the area. More then four-fifths of the area's total population of 282,000 (1930 Census) live in the country or in towns of less than 2,500 people.

Agriculture, which provides work for approximately half of those gainfully employed, is the principal source of income, although textiles, forest products, and mining are important. About 35 textile companies with more than 650,000 spindles are located in this unit, chiefly in Floyd, Whitfield, and Walker Counties. The principal marble industry of the State is in Pickens County.1/ Bartow and Walker Counties have important cement industries. Coal and limestone occur in north Georgia as well as many valuable minerals, such as asbestos, barytes, bauxite, feldspar, gold, graphite, iron ore, manganese, ocher, pyrite, sericite, slate, talc, and clays.

According to the Census of Agriculture, in 1935 there were almost 33,000 farms with an aggregate area of 2-3/4 million acres (table 2). Most of the farms are small, i.e., they contain less than 100 acres each. Only 29 percent of the farms have 100 acres or more, but these large farms together make up almost two-thirds of the total farm area. The average size of the farms is about 84 acres, of which 46 acres (55 percent) are farm woodlands. These farm woodlands, which occupy about 1½ million acres, contribute important quantities of forest products both for farm use and for cash income. The area in cropland remained practically unchanged between 1924 and 1934.

Table 2. - Number and acreage of farms according to size, 1935

Size	Number of farms	Proportion of total number	Acreage in farms	Proportion of total acreage
Acres		Percent	Acres	Percent
Less than 50	14,582	44.7	353,591	12.9
50 - 99	8,661	26.5	609,025	22.1
100 - 499	9,077	27.8	1,523,422	55.4
500 - 999	249	.8	156,202	5.7
1000 and over	56	.2	106,111	3.9
Total	32,625	100.0	2,748,351	100.0

In 1934, the most widely planted crop, corn, occupied about 327,000 acres, practically the same area as in 1909; but the principal cash crop, cotton, was planted on only 163,000 acres, a decrease in acreage of over 23 percent since 1909. For the entire area, the average yield per acre of corn in 1934 was about 13 bushels; and of cotton, one-half bale. Both these yields were greater than corresponding averages for the State of Georgia as a whole.

The frost-free season ranges from about 5½ months in the mountains to about 6½ in the valleys. Rainfall is plentiful, ranging from about 50 inches at low elevations to more than 60 in the highlands. Adequate drainage is provided mainly by the Coosa, Chattahoochee, Tennessee, and Savannah river systems.

1/ Industrial Georgia. Year Book 1930. Georgia Power Co. 102 pp., illus.

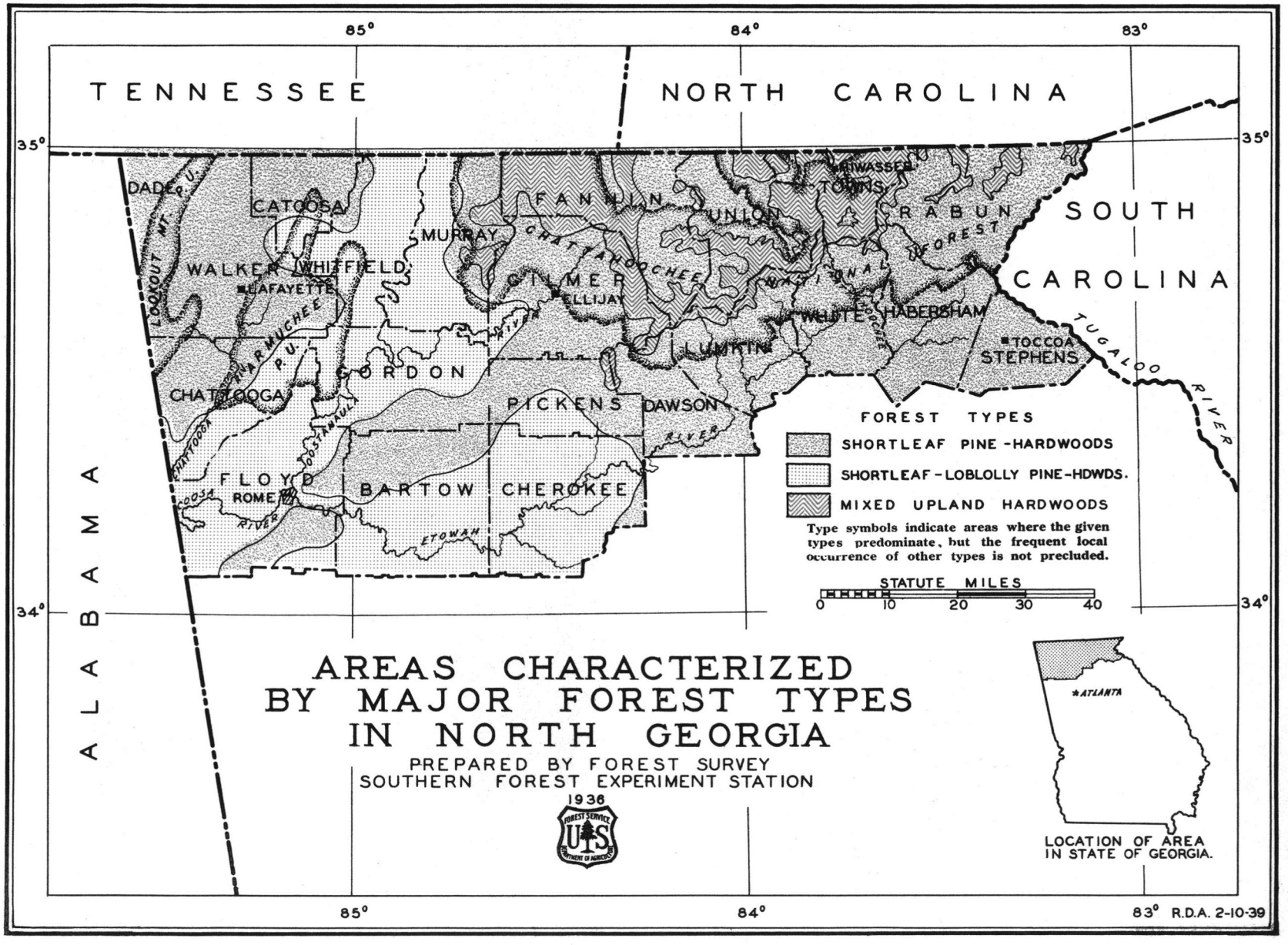


FIGURE-1, FOREST TYPE MAP.

Generally unsuited for transportation, the turbulent mountain streams are rich in hydroelectric power. On the Tallulah, Tugalo, and other rivers in this area, in 1937 there were 10 hydroelectric plants with an aggregate capacity of over 186,000 kilowatts and an annual output for 1937 of approximately 500 million kilowatt-hours.

This section is served by several railroads including the Louisville and Nashville; the Southern; the Nashville, Chattanooga, and St. Louis; the Central of Georgia; the Tennessee, Alabama, and Georgia; the Tallulah Falls; and the Seaboard Air Line. Approximately 500 miles of paved or surface-treated highways are in the unit, as well as a much greater mileage of secondary roads.

In the eastern and central parts of the area, where the steep mountains are located, the principal soils are (1) the sandy and clay loams derived from the gray-red granitic lands of the Cecil series, and (2) the "slate lands" derived from greasy, micaceous subsoils of the Talladega series. The topsoil has in many places been removed by erosion, leaving the subsoil largely reddish clay, on the surface. In the western part, where long, narrow, northeast-southwest ridges are separated by wide valleys, the principal soils are of the Clarksville series, largely silt-loams and gravelly-loams, developed from highly cherty limestone.

From an agricultural dominant-use standpoint, the farms in the northeast part of this area are labeled by Hartman and Wooten2/ as "self-sufficing," "part-time," or "forest products"; in the southeast part as "cotton"; and in the western part as "cotton," "dairy," or "some truck and fruit." Probably not more than one-tenth of the western part of the area is in prosperous valley farms, while the remainder may be used best for forest crops or pasture and hay. The northeast part of the area is generally so rough and mountainous that profitable agriculture is confined chiefly to the relatively small area of alluvial soils in the major stream bottoms.

As shown by figure 2, a small proportion of the total area of the counties in the northeast part is classed as "land available for crops," including cropland and plowable pasture (Census of Agriculture, 1935). Most of the area not considered as available for crops is forest land.

Only 14 percent of the total area is in public ownership, 65 percent is in farms, and 21 percent is in other private ownerships (fig. 3). For the forest area alone (fig. 4) the ownership status is estimated as follows:

National forest	599,000 acres	
Other publicly owned forest . . .	8,000 acres	
Farm woodlands	1,514,500 acres	(Census)
Other privately owned forest . .	713,800 acres	
Total forest	2,835,300 acres	(Forest Survey)

Although much of the land within the National forest boundaries is privately owned, the gross area within the National forest includes over 75 percent of the total area of Rabun, Towns, Union, and Fannin Counties.

2/ Hartman, W. A. and Wooten, H. H. Georgia land use problems. Georgia Expt. Sta. Bull. 191. 195 pages, illus., 1935.

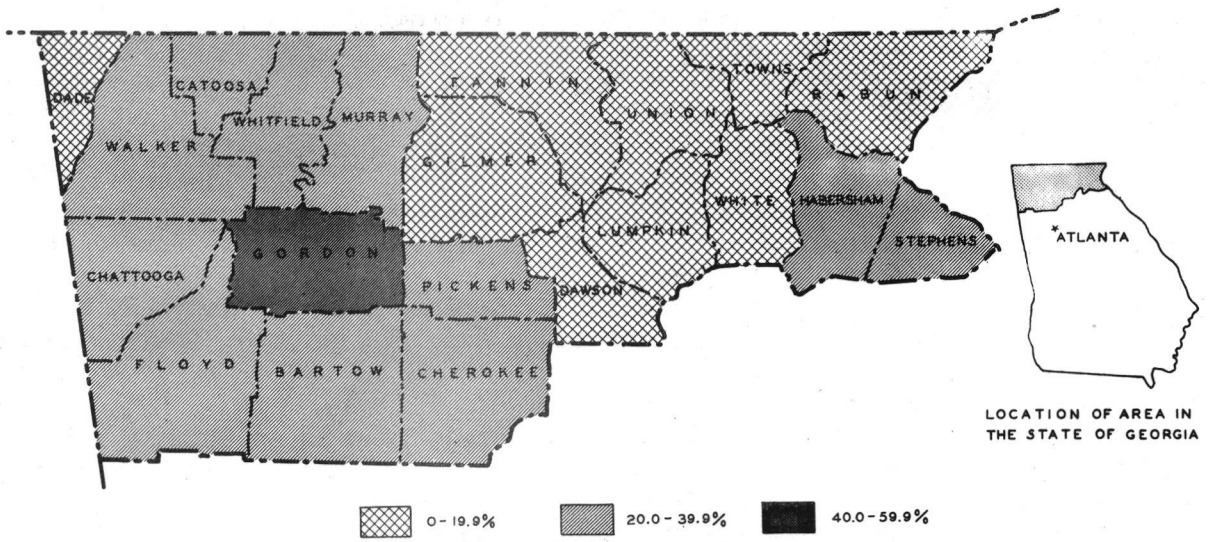


FIGURE 2.- PROPORTION OF COUNTY IN LAND AVAILABLE FOR CROPS (CENSUS OF AGRICULTURE, 1935).

According to the forest survey made during the last 3 months of 1935, approximately two-thirds of the area of north Georgia was forest (table 1). Of the remaining one-third, that is, the nonforest land, old cropland occupied by far the largest area. Not to be overlooked, however, is the 240,800 acres of idle and abandoned cropland; some of this will revert to forest, while some will be cultivated again if the prices of corn and cotton rise sufficiently. In north Georgia, the common farming practice is to allow the land to pass through a cycle of use-stages: starting with the natural forest, areas are cleared and cultivated until erosion becomes serious, then used as pasture, and finally allowed to reforest naturally. Until a grass, weed, or tree growth is established, however, erosion continues after cultivation is abandoned, unless terraces, check dams, or other artificial deterrants to run-off are constructed.

Table 3. - Correlation of land use with erosion, 1936

Land use	Type of erosion				Total
	None or arrested	Sheet	Shoe-string	Gullies	
	Acres				
Forest	2,706,300	53,200	30,500	45,300	2,835,300
Cropland in cultivation	750,700	151,700	46,900	5,500	954,800
Idle and abandoned cropland	152,500	41,400	28,100	18,800	240,800
Pasture	129,000	6,300	10,200	7,000	152,500
Total	3,738,500	252,600	115,700	76,600	4,183,400
Percent of total	89.4	6.0	2.8	1.8	100.0

Soil erosion in some form and to some degree is occurring almost everywhere in this area, but in this report only the well-marked and destructive stages are recognized. In making the field survey, the following forms of erosion were recorded: (1) sheet erosion, in which the soil is washing off from a generally smooth surface; (2) shoestring erosion, in which the soil surface is cut into, and a system of small, branching gullies from a few inches to not over 2 feet deep is formed; and (3) gully erosion, in which the soil surface is being destroyed by deep gully systems. Table 3 presents existing interrelationships between erosion and land use as indicated by the sample plots. Marked erosion, in one or more of these three forms, is found on 21 percent of the cropland, 37 percent of the idle and abandoned land, 15 percent of the pasture, but on only 5 percent of the forest land, which includes many old gullied fields with only a partial stocking of trees.

The small percent of erosion on the forest land is especially noteworthy when one considers that steep slopes (i.e., slopes of more than 30 percent), which are more characteristic of north Georgia than of any other part of the State, occur on approximately 40 percent of the forest area but on only 1 percent of the cropland in cultivation (table 4).

Table 4. - Forest and agricultural area classified according to land use and slope, 1936

Land use	Slope			Total
	Gentle (0-10%)	Moderate (11-30%)	Steep (31% and over)	
	Acres			
Forest	510,600	1,197,900	1,126,800	2,835,300
Cropland in cultivation	695,200	249,400	10,200	954,800
Idle and abandoned cropland	130,600	99,300	10,900	240,800
Pasture	101,600	45,400	5,500	152,500
Total	1,438,000	1,592,000	1,153,400	4,183,400

Description of the Forest

Shortleaf pine, by far the most important forest species in the unit, is often associated with hardwoods and with loblolly and Virginia pines. A few hemlocks, cedars, and pitch, northern white, and mountain pines also are found. Of the hardwoods, oaks, hickories, yellow poplar, gums, and maples are the most prevalent, but black locust, dogwood, basswood, beech, elms, ash, and birch also occur. Chestnut, an important hardwood, which in the mountainous areas probably made up one-third of the original timber, has been wiped out by the blight, but many dead, usable trees remain. Chestnut and the dead trees of other species are not included in the timber inventory, however, unless specifically stated.

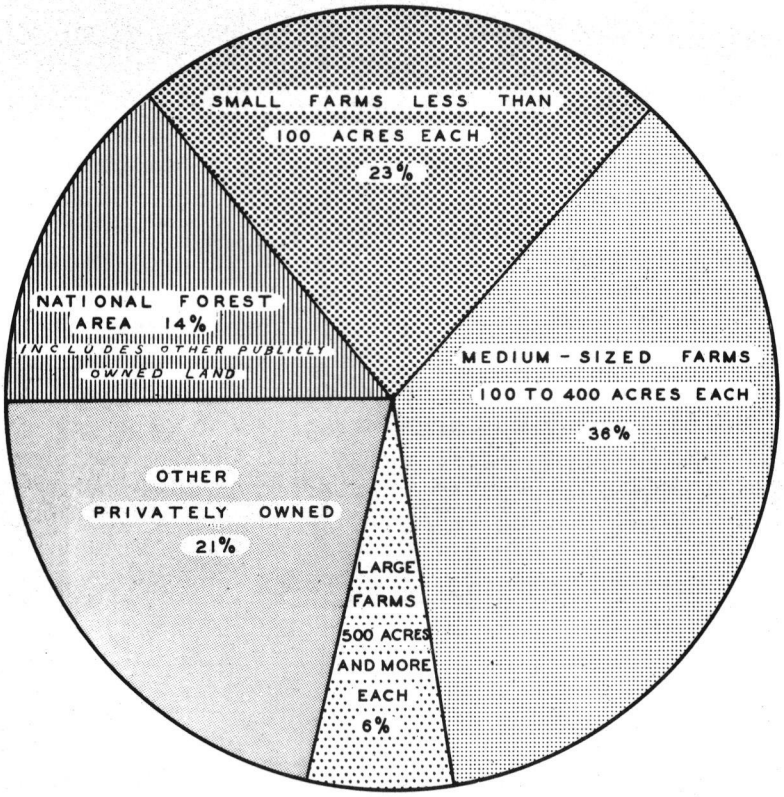


FIGURE 3. - TOTAL LAND AREA IN VARIOUS OWNERSHIPS.

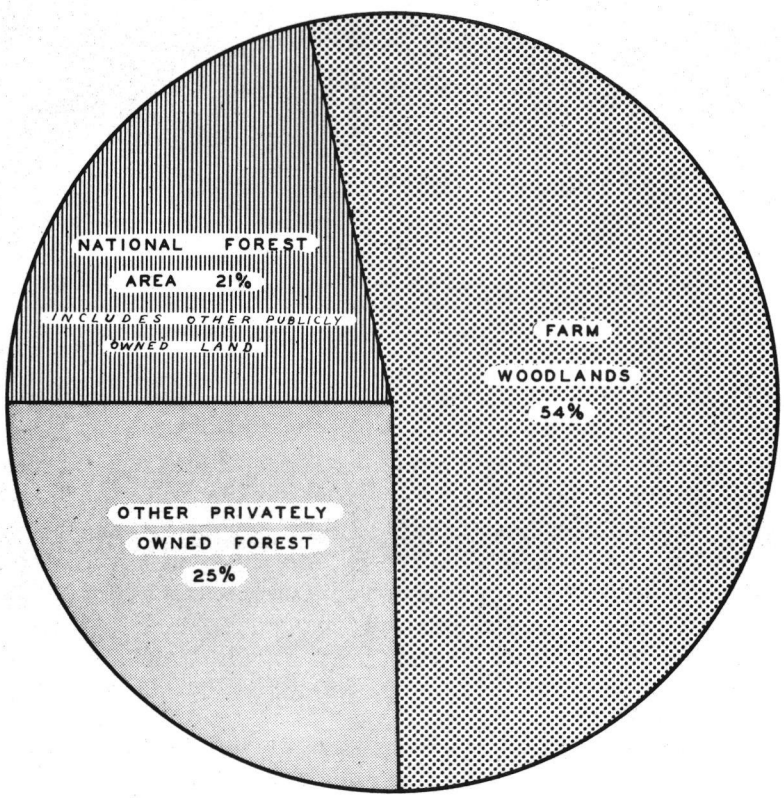


FIGURE 4.- FOREST LAND IN VARIOUS OWNERSHIPS.

The various species of forest trees may be combined into three main type-groups (table 5). The pine type-group (mostly in the southern and western parts and on the south slopes) covers 39 percent of the forest area (table 6), and includes, in addition to the widespread shortleaf pine type, smaller areas in the loblolly pine, Virginia pine, white pine, and hemlock types. The pine-hardwood type-group, found on 23 percent of the forest area, is generally the shortleaf pine-hardwood type, but less often it is made up of the loblolly pine- or Virginia pine-hardwood and occasionally the white pine-hardwood types. The hardwood type-group (mostly in the northeastern part, in stream bottoms and on north slopes) occupies 38 percent of the total forest area; it includes large areas of oak and oak-chestnut type and a small representation of the cove hardwood, yellow poplar, scrub hardwood, and other hardwood types. The prevalence of certain major forest types over large areas is shown on the map (fig. 1), although within the broad ranges there delineated, occur many small intermingled areas of other types, as well as areas of cleared land.

Table 5. - Species composition[1/] of the various type-groups

Species or species-group	Type-group			Total
	Pine	Pine-hardwood	Hardwood	
	Percent			
Shortleaf, pitch, and mountain pines	55.1	33.9	2.5	34.8
Loblolly pine	17.9	7.1	.5	10.4
Virginia pine and other conifers	14.4	11.2	3.2	10.3
Red oaks	4.5	17.6	34.2	16.3
White oaks	2.5	11.0	26.4	11.6
Hickory	1.6	5.7	9.8	4.9
Yellow poplar	.6	3.8	7.8	3.4
Other hardwoods	3.4	9.7	15.6	8.3
Total	100.0	100.0	100.0	100.0

1/ Based on cubic-foot volume, outside bark of trees 5.0 inches d.b.h. and larger.

Only 12 percent of the forest area is in the old-growth condition, which resembles the original-growth timber in that it has a high proportion of large trees suitable for lumber (table 6). The old growth, most of which is in the hardwood types, is either in a few large blocks, chiefly on the mountains and in the river bottoms of the National forest, or in small isolated patches. The uncut old-growth stands, for all type-groups combined, average 4,100 board feet per acre, green lumber tally, based on the International $\frac{1}{4}$-inch rule, in sawlog-size trees[3/], while the partly cut stands, in which 10 percent or more of the sawlog-size trees have been removed, average about 3,200 board feet per acre.

Second-growth stands, found in all parts of the unit, in both small and large tracts, occupy 85 percent of the total forest area. Having developed

3/ Sawlog-size pines are at least 9.0 inches d.b.h. and hardwoods at least 13.0 inches.

above the stumps of the original timber or upon abandoned fields, these young stands constitute the main part of the present forest resource as well as the foundation of the forest of the future. The uncut second-growth sawlog-size stands, all types combined, have an average volume of 3,100 board feet (green lumber tally); the partly cut stands have an average volume of 2,500 board feet per acre, and a minimum of 400 board feet. Under-sawlog-size stands, made up chiefly of saplings less than 9 inches d.b.h. for the pines and less than 13 inches for the hardwoods, occupy a large part of the area but have very light volumes; for all types combined, these stands have an average of less than 300 board feet of saw timber per acre in a few sawlog-size trees, or about 5 standard cords in all growing-stock trees 5 inches d.b.h. and larger.

Table 6. - Forest area classified according to forest condition and forest type-group, 1936

Forest condition	Forest type-group			Total all types	Proportion of total
	Pines	Pine-hardwoods	Hardwoods		
	Acres				Percent
Old growth:					
Uncut	36,800	23,400	138,400	198,600	7.0
Partly cut	36,700	20,400	94,600	151,700	5.4
Total	73,500	43,800	233,000	350,300	12.4
Second growth:					
Sawlog size:					
Uncut	510,600	192,400	331,500	1,034,500	36.5
Partly cut	165,800	71,100	82,900	319,800	11.3
Under sawlog size	295,500	331,600	412,100	1,039,200	36.6
Reproduction 1/	51,700	27,300	12,500	91,500	3.2
Total	1,023,600	622,400	839,000	2,485,000	87.6
Total all conditions	1,097,100	666,200	1,072,000	2,835,300	100.0
Percent of total forest area	38.7	23.5	37.8	100.0	

1/ Includes 7,800 acres of clear-cut condition.

The reproduction condition, which is composed predominantly of seedlings and sprouts less than 1.0 inch d.b.h. without an overstory of larger timber, occupies only 3 percent of the total forest area; this includes a small area of clear-cut condition that has less than 80 seedlings per acre but may have an occasional seed tree. In general, the trees are such prolific seeders, or sprout so readily, that reproduction quickly becomes established after cutting the forest or abandoning the cultivated land. The species pattern of the new forest closely follows that of the old one, or of the adjacent seed trees.

The productivity or site index of the forest is indicated by the height in feet attained by average dominant trees at 50 years of age. For the areas dominated by pines, the proportion of the poorer sites is greater than in other Survey units in Georgia. In north Georgia the percentage of the various sites is as follows:

Site index in feet	Areas dominated by: Shortleaf pine Percent	Loblolly pine Percent	Other pines Percent
80 or better	2	25	6
70	11	43	7
60	45	28	33
50 or less	42	4	54
Total	100	100	100

Figure 5 includes 2 charts which show the volume per acre of the various 20-year age-classes and their distribution in the present forest; chart A is based on pine and pine-hardwood types, and chart B on hardwood types. For the purpose of comparison, the volumes of the most heavily-stocked 10 percent of the uncut stands for the same age-classes on weighted-average sites are indicated by the broken line. The age-class of the stands was determined in the field for each forest plot, and where there was more than one age-class on the same plot, the one which would provide the most of the next cut was recorded. The volumes are expressed in cubic feet, inside bark, with no deductions for woods cull.

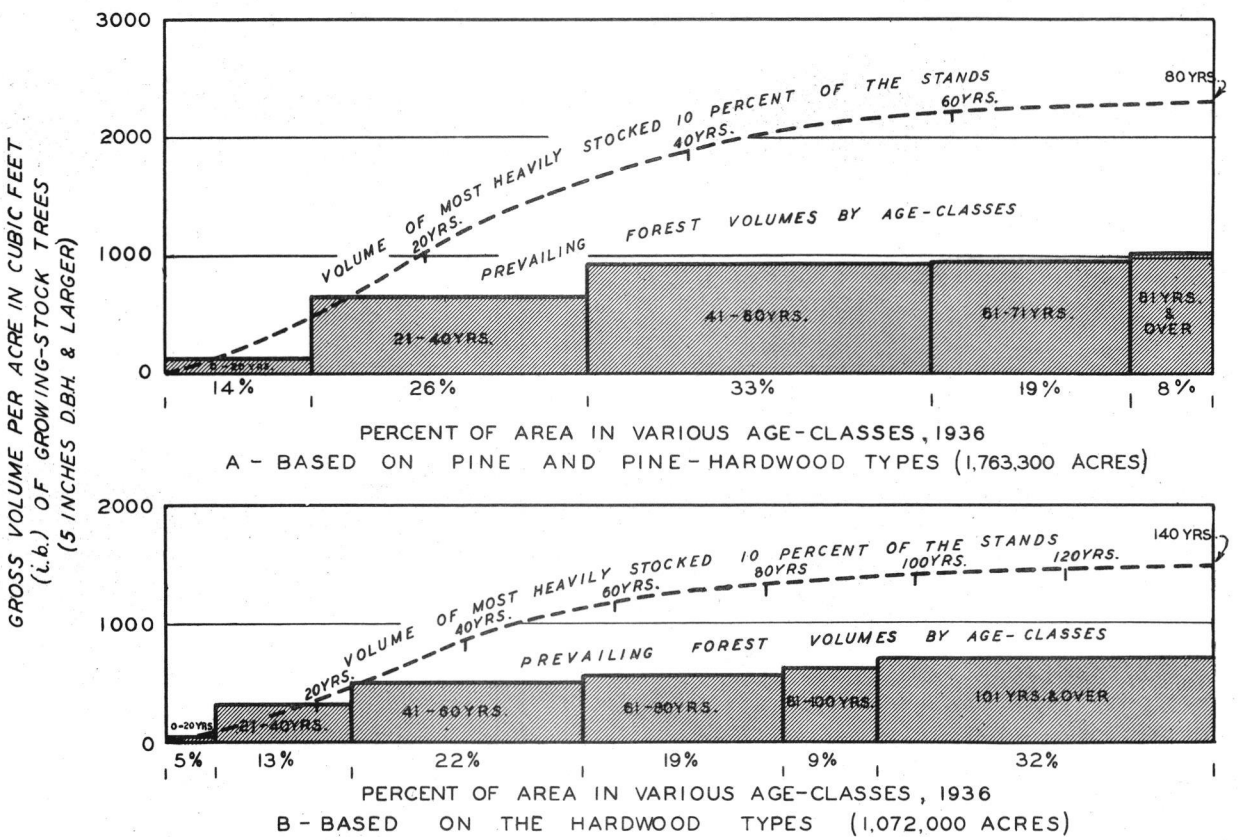


FIGURE 5.- DISTRIBUTION BY AREA OF PREVAILING AGE-CLASSES AND VOLUME, AND THE VOLUME IN WELL-STOCKED STANDS.

For the pine and pine-hardwood types, 40 percent of the area has stands up to 40 years old, 52 percent has stands 41-80 years old, and only 8 percent has stands at least 81 years old. Volumes per acre for the average stands range from 100 cubic feet per acre for the youngest 20-year age-class to slightly over 1,000 cubic feet for the oldest (81 years old and over). In striking contrast, the volume per acre of the well stocked stands, shown by the dotted line, amounts to over 1,000 cubic feet per acre at 20 years, 2,200 at 60 years, and 2,300 at 80 years. These volumes of well-stocked stands, however, are generally lower than those of corresponding stands and sites in other Forest Survey units in Georgia.

For the hardwood types, only 18 percent of the area has stands up to 40 years old, 41 percent has stands 41-80 years old, and 41 percent has stands at least 81 years old. The oldest age-class (trees 101 years old and over) includes many stands of over-mature hardwood trees that should be cut as soon as this is economically possible. Volumes per acre for the average stands range from 50 cubic feet for the youngest 20-year age-class to 700 cubic feet for the oldest. In contrast, the much higher volumes per acre of the well-stocked stands (shown by the broken line) amount to 400 cubic feet at 20 years, 1,200 at 60 years, and 1,400 at 100 years. That the growing stock of the prevailing forest stands can be doubled, is indicated by the volumes of the most heavily stocked 10 percent of the stands. Fire protection and other good management practices, however, will be required to increase the growing stock throughout the forest.

Figure 6 shows the relative prevalence of sound trees by diameter-classes[4/]. In the 2- and 4-inch classes there are more hardwoods than pines, but in the larger classes there are about as many pines as hardwoods. While there is a preponderance of 2-inch trees, it should be recognized that these small trees are so perishable that many will die from fire and the natural causes of mortality, e.g., overcrowding. With adequate fire protection a sufficient number of these small trees will live to increase the stocking in the presently understocked large-diameter classes.

Large trees, viz., those over 15 inches d.b.h., are relatively scarce. Since most of the high-grade lumber and veneer stumpage is usually taken from these large trees, particular attention should be given to the building up of the large-tree component of the growing stock. When the stands are logged, selective cutting should be practiced, i.e., the over-mature, poorly formed, defective, and slow-growing trees, irrespective of size, should be removed where economically possible, along with some of the better trees, leaving many of the larger and faster-growing trees to develop high-quality saw timber. As a general rule, the cuttings should be made as frequently as economic conditions and the growth of the stands will permit, but the volume removed at any one time from the growing stock should, in general, not exceed the net increment expected before the next cutting.

4/ The 2-inch class ranges from 1.0 to 2.9 inches d.b.h., the 4-inch class from 3.0 to 4.9 inches, and so on.

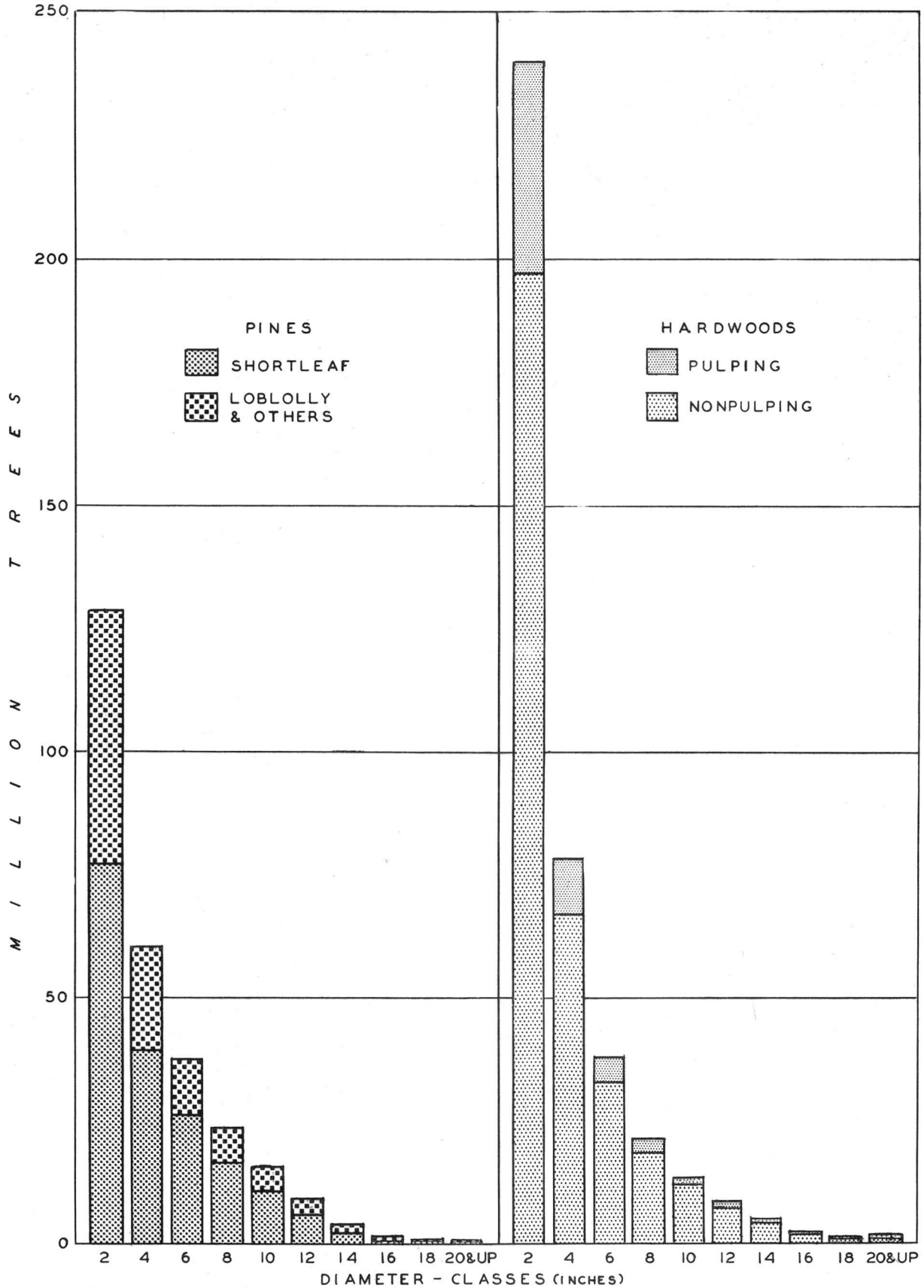


FIGURE 6.- STAND DIAGRAMS OF SOUND TREES.

Estimates of Timber Volume

Saw-timber volume

The Survey classified as saw-timber trees all living pines at least 9.0 inches d.b.h., and all living hardwoods at least 13.0 inches d.b.h., if they contained one sound butt log at least 12 feet long, or if 50 percent of their gross volume was in sound material. The total net saw-timber volume in this unit is more than 5½ billion board feet, according to the International ¼-inch rule, which closely approximates green lumber tally (table 7); or over 3¼ billion board feet, according to the Doyle scale, which is in general use in the South. All figures are net, deductions having been made for both woods and mill cull, that is, for portions of the tree which cannot be manufactured into lumber because of fire scars, rot, sweep, crook, bad knots, or other defects.

Table 7. - Net board-foot volume of live trees[1] (green lumber tally, based on International ¼-inch rule) in the various forest conditions, 1936

Tree species-group	Old growth		Second growth			Total	Proportion of total
	Uncut	Partly cut	Sawlog size		Under sawlog size[2]		
			Uncut	Partly cut			
	Thousand board feet						Percent
Pines and other softwoods:							
Shortleaf pine[3]	188,100	145,900	1,453,300	376,900	124,900	2,289,100	41.2
Loblolly pine	35,100	34,200	552,100	168,800	34,700	824,900	14.9
Virginia pine	29,000	20,800	304,300	44,200	25,600	423,900	7.6
White pine, hemlock, and cedar[4]	104,300	19,200	143,900	25,100	6,300	298,800	5.4
Total conifers	356,500	220,100	2,453,600	615,000	191,500	3,836,700	69.1
Hardwoods:							
Yellow poplar	78,300	19,100	90,700	14,700	5,800	208,600	3.8
Red oaks[5]	155,800	78,700	335,500	81,600	48,700	700,300	12.6
Forked-leaf white oaks	58,900	45,200	75,200	19,700	11,300	210,300	3.8
Chestnut oaks	100,500	28,200	93,100	8,600	10,200	240,600	4.3
Hickory	35,500	49,400	55,900	16,900	14,400	172,100	3.1
Other hardwoods	33,000	38,500	67,700	27,800	15,700	182,700	3.3
Total hardwoods	462,000	259,100	718,100	169,300	106,100	1,714,600	30.9
Total all species	818,500	479,200	3,171,700	784,300	297,600	5,551,300	100.0
Percent of total	14.8	8.6	57.1	14.1	5.4	100.0	

1/ Chestnut not included.
2/ Includes 3,400 M board feet in residual trees in the reproduction and clear-cut conditions.
3/ Includes pitch and mountain pines.
4/ Includes 192,200 M board feet of white pine.
5/ Includes 158,600 M board feet of northern red oak.

Of the total lumber-tally volume, coniferous species, with shortleaf pine by far the most important, make up over two-thirds; hardwoods, with red and white oaks predominating, less than one-third. This is shown in table 7, in which the small volumes of ash, beech, elm, gums, maples, etc. are combined as "other hardwoods." Much of the hardwood volume is in the Appalachian Mountain Range and is similar to hardwood cut in North Carolina and Tennessee and advertised as "Appalachian hardwood."

Old-growth stands, all types combined, contain 23 percent of the saw-timber volume; second-growth stands, 77 percent. In the old-growth conditions, uncut and partly cut combined, hardwood has a greater volume than pine, but in the second-growth conditions pine has over three times as much volume as hardwood.

The diameter distribution of the net saw-timber volume is given in table 8, which shows that 53 percent of the pine is in trees of the 10- and 12-inch classes and that 62 percent of the hardwood is in the 14-, 16-, and 18-inch classes. As a general rule, small saw-timber trees contain little material suitable for high-grade lumber or veneer.

Table 8. - Diameter distribution of net board-foot volume (green lumber tally, based on International $\frac{1}{4}$-inch rule) in the various forest conditions, 1936

Species-groups and diameter-classes (in inches)	Old growth		Second growth			Total	Proportion of total
	Uncut	Partly cut	Sawlog size: Uncut	Sawlog size: Partly cut	Under sawlog size[1/]		
	Thousand board feet						Percent
Pines:							
10 - 12	47,300	65,700	1,381,100	357,800	165,800	2,017,700	52.6
14 - 16	88,200	50,400	740,900	193,500	23,700	1,096,700	28.6
18 - 20	83,900	66,700	234,100	52,200	2,000	438,900	11.4
22 and over	137,100	37,300	97,500	11,500	-	283,400	7.4
Total pines	356,500	220,100	2,453,600	615,000	191,500	3,836,700	100.0
Hardwoods:							
14 - 18	173,600	119,900	539,600	137,700	93,200	1,064,000	62.0
20 - 28	228,300	128,000	166,100	31,600	12,900	566,900	33.1
30 and over	60,100	11,200	12,400	-	-	83,700	4.9
Total hardwoods	462,000	259,100	718,100	169,300	106,100	1,714,600	100.0

1/ Includes 3,400 M board feet in the reproduction and clear-cut conditions.

As shown in table 9, more than half the saw-timber volume in coniferous species is in limby and rough trees. Shortleaf pine has the highest percentage of volume in smooth trees; white pine, Virginia pine, and hemlock combined have the lowest. For all coniferous species combined, trees in the old-growth conditions generally are much higher in lumber quality than those in the second growth.

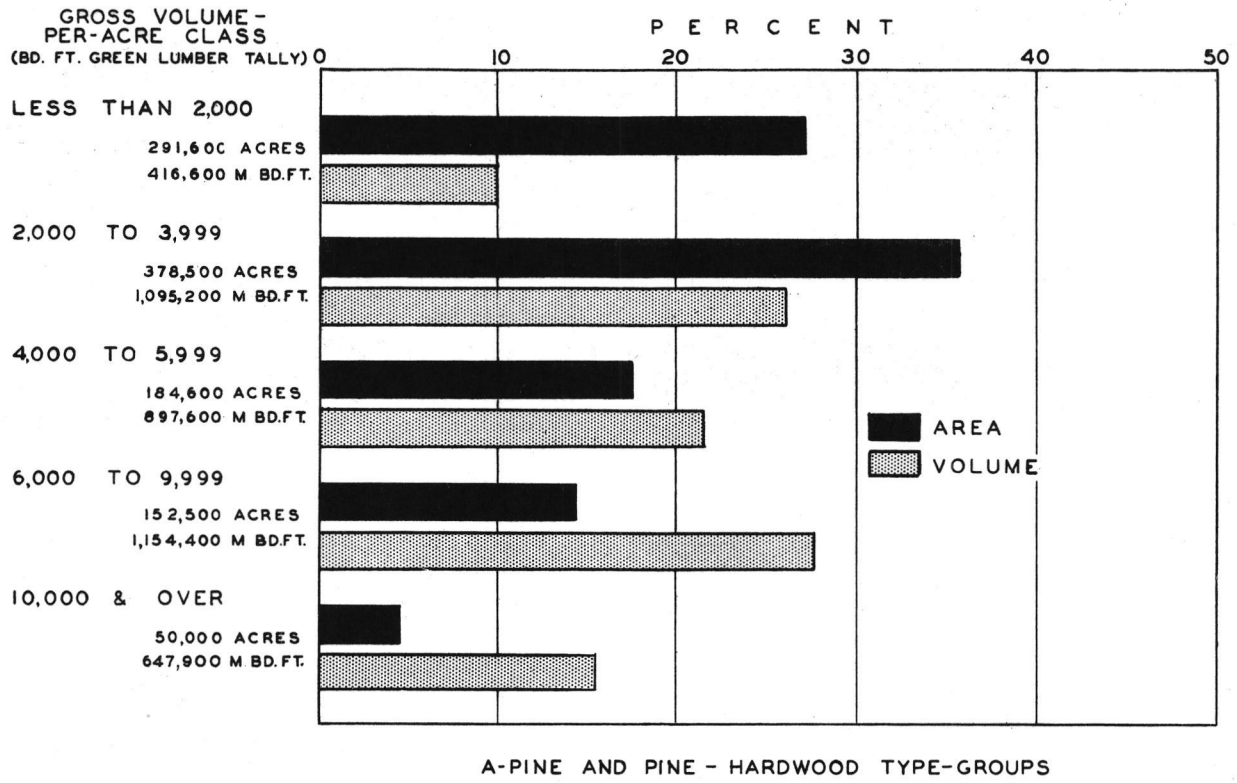
Table 9. - Classification of the coniferous species according to grade of trees of saw-timber quality (based on supplemental data)

Species and stand condition	Tree grade 1/			Total
	Smooth	Limby	Rough	
	Percent of volume			
Shortleaf pine:				
Old growth	93	7	-	100
Second growth	57	41	2	100
Weighted average	62	36	2	100
Loblolly pine:				
Old growth	84	16	-	100
Second growth	50	45	5	100
Weighted average	53	42	5	100
White pine, Virginia pine, hemlock, and cedar:				
Weighted average	7	68	25	100
All conifers combined:				
Old growth	66	26	8	100
Second growth	47	47	6	100
Weighted average	49	44	7	100

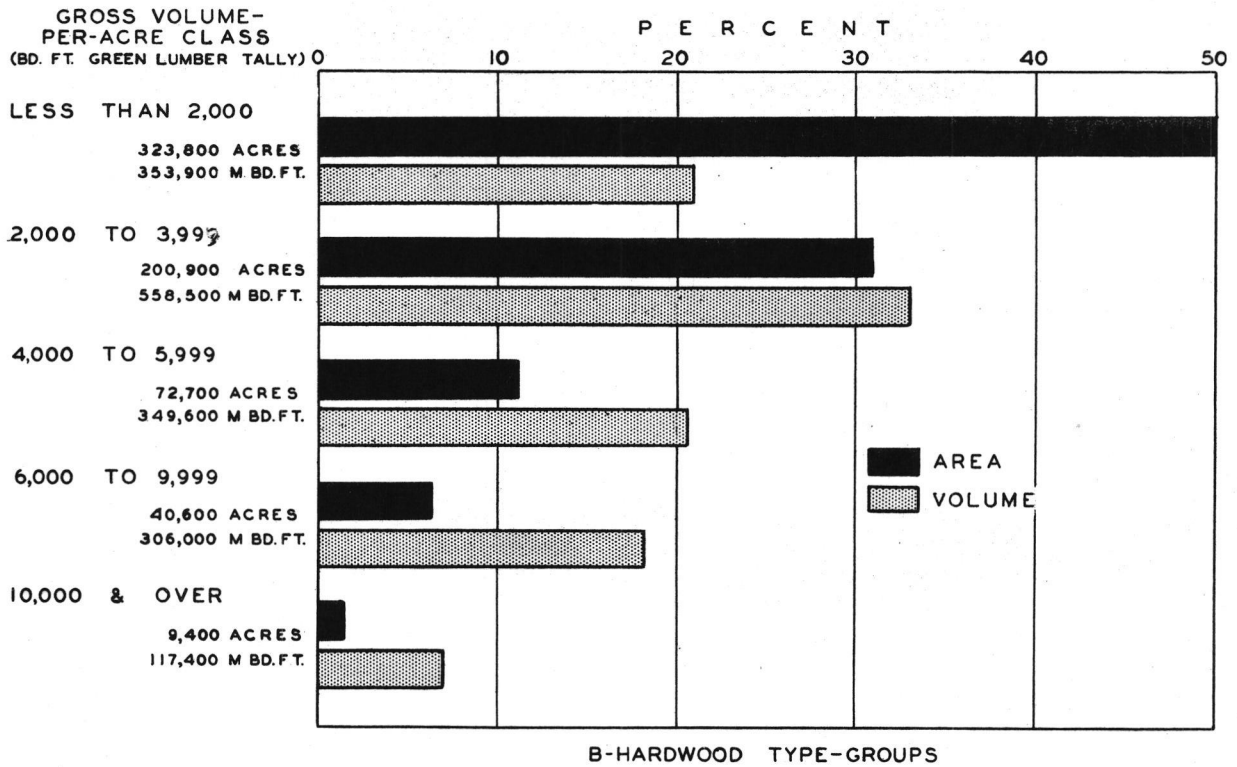
1/ Smooth trees have 20 feet or more of clear length and also at least 50 percent of their total usable length practically free of limbs and indications of knots; limby trees have at least 12 feet of clear length and 30 to 49 percent of their total usable length practically free of limbs and indications of knots; rough trees have less than 12 feet of clear length, or less than 30 percent of their total usable length, practically free of limbs and knots.

Due to the fact that logging costs per thousand board feet usually decrease as the volume per acre increases, the volume density or stand per acre greatly influences the economic value of the forests. The area and volume-per-acre distribution of the sawlog-size conditions are given in figure 7. The volumes are gross, since no deductions have been made for cull. In the pine and pine-hardwood type-groups (A), 28 percent of the area and 10 percent of the volume are in stands with less than 2,000 board feet (green lumber tally) per acre; and it follows that 72 percent of the area and 90 percent of the volume are in stands of 2,000 board feet or more. In the hardwood type-groups (B), the proportion of light stands is much greater.

The fact that 93 percent of the forest area of north Georgia has been logged at least once, in spite of the mountainous nature of the terrain in the east and northwest parts of the unit, indicates the accessibility of the forests. Most of the relatively small area of inaccessible land is in the National forest, where active road building is rapidly opening up new areas for utilization.



A-PINE AND PINE - HARDWOOD TYPE-GROUPS



B-HARDWOOD TYPE-GROUPS

FIGURE 7. -AREA AND VOLUME-PER-ACRE DISTRIBUTION OF THE SAWLOG-SIZE CONDITIONS, CLASSIFIED ACCORDING TO VOLUME OF SAW TIMBER PER ACRE.

Cordwood volume [5/]

In living trees 5.0 inches d.b.h. and larger, the total net volume of usable cordwood material, bark included, is more than 35 million standard cords (4 x 4 x 8 feet). It should be understood, however, that this includes volume shown in the saw-timber estimate given in the preceding section. As previously stated, all volume figures are net, deductions having been made for woods cull — the material unsuitable for use because of fire scar, crook, excessive limbiness, rot, or other defects.

In table 10, cordwood volumes are given by species-groups and according to the following sources:

1. From the merchantable stems of sawlog-size trees.

2. From that portion of saw-timber trees not used as sawlogs but usable as cordwood; this includes the upper stems of all species to a variable top-diameter (but not less than 4 inches), and the limbs of hardwoods to a 4-inch minimum.

3. From sound trees under sawlog size but at least 5.0 inches d.b.h.; here the entire stem of all species is included to a variable top-diameter (but not less than 4 inches).

4. From the estimated sound material in sound and rotten cull trees, including scrub oaks, which are classed as sound culls.

Fuel wood and pulpwood are the principal uses for cordwood material that is unsuited for saw timber. While most species are useful for fuel wood, the pines and the soft-textured hardwoods, such as yellow poplar, cucumber magnolia, red gum, and maple are preferred for pulpwood in this locality. More than four-fifths of the total pulpwood inventory of about 18 million cords is in pine. "Nonpulping" species are not commonly pulped at present but in the future may be found suitable. Not included in the data given above is a volume of chestnut roughly estimated to be about 2 million cords, mostly in dead trees. Some of this dead material is cut into lumber, and small quantities are being converted into fuel wood and fence posts.

Figure 8 shows graphically the cordwood volumes in live, sound trees only, by size-classes. Trees from 5.0 to 13.0 inches d.b.h., rarely suitable for high-grade lumber and veneer, include 70 percent of the pine volume and 51 percent of the hardwood. As this report will indicate in the following pages, much of the growth is occurring on these small, low-quality trees.

5/ For more detailed information, see "Sawtimber and cordwood volumes in North Georgia," Forest Survey Release No. 30, Feb. 10, 1938. Southern Forest Expt. Sta., New Orleans, La.

Table 10. - Net volume in various classes of sound material[1], 1936

Species-group	Sawlog portion of saw-timber trees	Upper stems of saw-timber trees	Sound trees under saw-log size	Sound and rotten cull trees [2]	Total all classes	Proportion of total
	Cords (bark included)					Percent
Pines, hemlock, and cedar	8,478,200	1,182,100	4,284,600	914,600	14,859,500	42.1
Hardwoods:						
Pulping[3]	842,700	483,900	960,200	828,100	3,114,900	8.8
Nonpulping	3,613,300	2,091,100	6,291,400	5,330,700	17,326,500	49.1
Total hardwoods	4,456,000	2,575,000	7,251,600	6,158,800	20,441,400	57.9
Total all species	12,934,200	3,757,100	11,536,200	7,073,400	35,300,900	100.0
Percent of total	36.7	10.6	32.7	20.0	100.0	

1/ Does not include about 2 million cords of sound chestnut material, mostly in dead trees.
2/ Includes all scrub oaks as nonpulping hardwoods.
3/ 1,416,000 cords of yellow poplar; 1,698,900 cords of cucumber magnolia, gums, maple, basswood, etc.

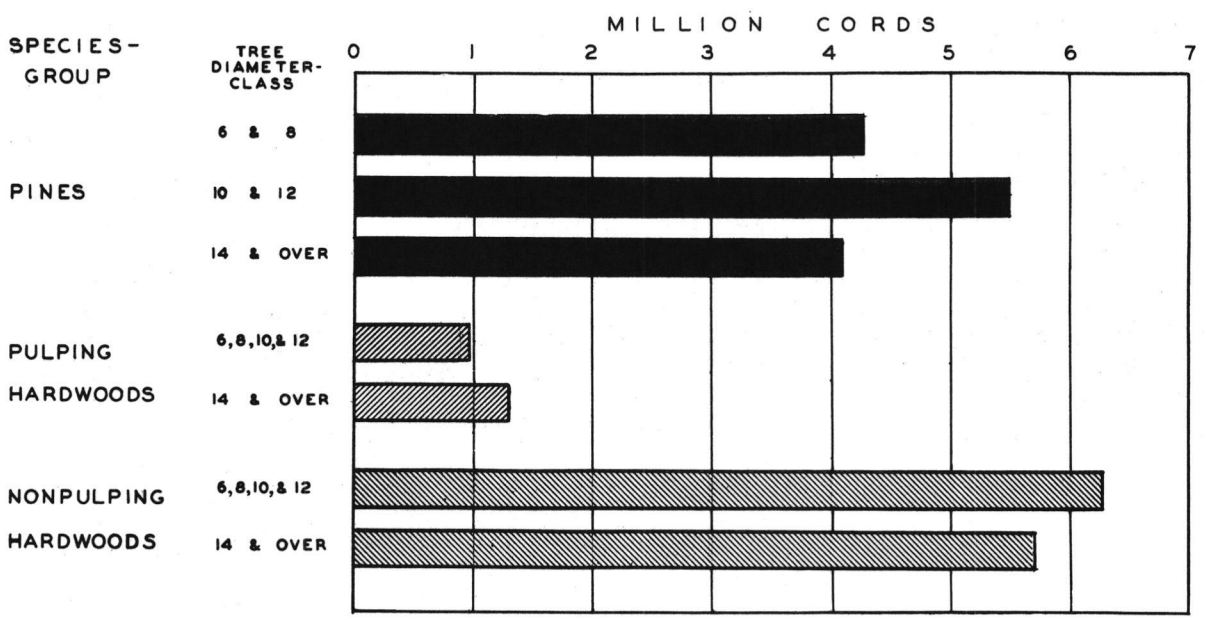


FIGURE 8.- CORDWOOD VOLUMES OF PULPING AND NONPULPING SPECIES BY SIZE-CLASSES, SOUND TREES ONLY.

The growing stock of all species made up of live, sound trees (chestnut, cull trees, and the upper stems and limbs of sawlog-size hardwoods excluded) amounts to 12 million cords in sound trees under sawlog size and 14 million cords in sawlog-size trees, or a total of about 26 million cords. The volume per acre of growing-stock trees, measured in cords, for the various forest conditions and type-groups, computed by dividing total volume by the corresponding area, is given in table 11. The competitive demand for saw timber, and the present larger stumpage prices paid for lumber, cross ties, veneer, poles, and piles encourage the holding of a considerable part of the under-sawlog-size trees of the growing stock for such future uses. Since many trees of the growing stock, however, are so rough and limby that they may never be suitable for high-grade material, selection of the trees to be held should depend upon smoothness and other indications of quality, as well as upon rapidity of growth. Of importance in a consideration of better forests and forest utilization is the fact that there are over 7 million cords of usable wood in cull trees and 2 million cords of usable chestnut wood in dead trees, all of which, if used as fully as possible, should reduce the consumption of growing-stock trees for fuel wood and other low-requirement uses.

Table 11. - Average volumes of cordwood per acre in growing-stock trees, 1936

Forest type-group	Old growth		Second growth			All conditions 1/
	Uncut	Partly cut	Sawlog size		Under sawlog size	
			Uncut	Partly cut		
	Cords (bark included)					
Pine	15.7	12.7	15.9	12.2	4.2	11.3
Pine-hardwood	13.8	11.8	11.3	10.4	4.1	7.3
Hardwood	11.8	10.5	8.9	7.6	5.3	7.8
Weighted averages all types	12.8	11.2	12.8	10.6	4.6	9.0

1/ Includes areas of reproduction and clear-cut forest conditions.

Poles and piles

A special inventory was made of pine trees suitable for poles and piles, based upon the specifications of the American Standards Association; the resulting estimate of 10½ million trees suitable for these uses is believed to be conservative (table 12). These trees, which have been included in the volume inventories previously given, are scattered throughout the area, singly or in groups. Most of the pole and pile pieces are 20 and 25 feet long and in trees less than 11.0 inches d.b.h. outside bark.

Table 12. - Total number of pine poles or piles, classified according to length and diameter, 1936

D.B.H. of trees (outside bark)	Pole or pile length (feet)			Total	Proportion of total
	20 and 25	30 and 35	40 and over		
Inches	- - - - - - Thousand pieces - - - - - - -				Percent
7.0 - 8.9	3,385	168	-	3,553	33.3
9.0 - 10.9	2,586	972	39	3,597	33.7
11.0 - 12.9	1,408	823	96	2,327	21.8
13.0 - 14.9	462	374	74	910	8.5
15.0 and up	59	183	46	288	2.7
Total	7,900	2,520	255	10,675	100.0
Percent of total	74.0	23.6	2.4	100.0	

Forest Increment

Forest increment, as used in this report, means the difference between the net volume of growing-stock trees standing on the area at the beginning and at the end of a year, before deducting the total commodity drain for the year. Board-foot increment is made up of the growth on sawlog-size trees and the total board-foot volume of trees becoming sawlog size during the year, with appropriate deductions for mortality. Cordwood increment represents (a) the growth on the sound stem wood of pines 5.0 inches d.b.h. and over, on under-sawlog-size hardwoods, and on the sawlog portion of hardwoods 13.0 inches d.b.h. and larger; (b) the total volume in pines and hardwoods that become 5.0 inches d.b.h. or larger during the year; and (c) deductions for mortality. In calculating both the board-foot and cordwood increments, cull material and the upper stems of hardwoods are excluded.

Table 13. - Net increment in the various forest conditions, 1936

Forest condition	Saw-timber material			All material		
	Pine component	Hardwood component	Total	Pine component	Hardwood component	Total
	- - Thousand board feet (green lumber tally) - -			- - Thousand cubic feet (inside bark) - -		
Old growth	1,100	8,100	9,200	580	2,720	3,300
Second growth:						
Sawlog size	161,500	31,600	193,100	29,560	10,720	40,280
Under sawlog size[1/]	62,300	14,000	76,300	20,580	8,710	29,290
Total	224,900	53,700	278,600	50,720	22,150	72,870

1/ Includes 300 M board feet, or 120 M cubic feet, in the reproduction and clear-cut conditions.

In 1936, the gross growth amounted to 343 million board feet (green lumber tally), and the loss due to mortality was 64 million board feet, leaving a net increment of 279 million board feet, before deducting the commodity drain for the year. Second-growth stands contributed about 97 percent of the total saw-timber increment; old-growth stands, about 3 percent. Approximately four-fifths was pine and one-fifth was hardwoods (table 13). The net increment for all growing-stock trees 5.0 inches d.b.h. and larger, including those of sawlog size, was one million cords with bark, or 73 million cubic feet without bark. It is noteworthy, however, that much of the growth occurs on trees of relatively low quality.

In order to arrive at an estimate of average increments per acre for various forest conditions uninfluenced by cutting, the figures in table 14 were computed. These figures represent, therefore, the average increment that occurred on live trees that were on the area at the beginning of the year, deduction having been made only for mortality which occurred during the year. The board-foot figures are green lumber tally, based on the International $\frac{1}{4}$-inch rule, and the cordwood figures include the bark. The average net increment per acre, in 1936, of 99 board feet for saw timber, or one-third cord for all growing-stock material, is fairly close to the average for the South, although it is less than the average for the adjoining Georgia Forest Survey unit (No. 4). Present growth of the north Georgia forest stands is believed to be only one-third to one-half what it could be with good forest management. With fire protection and wise cutting practices, the growing stock could be greatly increased, and, simultaneously, the mortality could be decreased.

Table 14 - Average increment per acre in the various forest conditions, uninfluenced by cutting, 1936

Forest condition	Pine component			Hardwood component			Total		
	Bd.ft.	Cu.ft.	Cords	Bd.ft.	Cu.ft.	Cords	Bd.ft.	Cu.ft.	Cords
Old growth	4	1.8	.02	24	7.9	.12	28	9.7	.14
Second growth:									
Sawlog size:									
Uncut	126	22.8	.30	24	8.0	.12	150	30.8	.42
Partly cut	103	19.6	.25	22	8.2	.13	125	27.8	.38
Under sawlog size	59	19.9	.27	14	8.4	.13	73	28.3	.40
Weighted averages[1]	80	18.1	.24	19	7.9	.12	99	26.0	.36

1/ Including reproduction and clear-cut conditions.

Wood Products Industries

During the nineteenth century, in north Georgia there were only a few small sawmills, which cut lumber mainly for local consumption. In these early years of settlement, since suitable markets were lacking, many of the original forest stands were cut and burned to clear the land for agriculture. During the collapse of agriculture in the period following the War between the States, much of the cropland was abandoned. As the years passed, erosion robbed many fields of their fertile top soil, causing further abandonment and the clearing of new areas for cultivation. Fortunately, the abandoned fields quickly reverted to forests, and by 1905-1915 many of the old fields were supporting merchantable stands of timber. About this time, a strong demand arose for southern pine lumber in northern markets, and there began to come into the western and southern sections of north Georgia many small sawmills which concentrated upon the cutting of one product, "roofers"; these were pine boards 1 inch thick, which as a general rule comprised the log run and were sold ungraded. Concentration yards, with facilities for air-drying, planing, and shipping, were located along the railroads, each yard taking the output of several small mills. It is believed that the activity of the lumber industry reached a peak here between 1925 and 1929.

Today, although operating at a greatly reduced rate, the lumber industry is much the same as it was a decade ago, except that now there is some diversification and grading of products. In 1936, there were 346 sawmills, mostly in the western and southern parts of the area (fig. 9). These had a aggregate lumber production of about 82 million board feet (only 8 percent of the total production for the State), of which 75 million is pine and 7 million is hardwood, including sawed oak cross ties. All of the mills were small, i.e., each had a daily (10-hour) capacity of less than 20,000 board feet, and the average cut per mill for the entire year was only 236,000 board feet. As a whole, the sawmills, which are mostly farmer-owned and are operated only a few weeks between crops each year, cut only a small fraction of their yearly capacity.

It should be noted that the Appalachian Mountains, with their typical hardwoods, extend into north Georgia. In 1936, approximately 7 million board feet of hardwood sawlogs were shipped out of this unit to large hardwood sawmills in Tennessee and North Carolina. This material has the quality of, and is sold as, "Appalachian hardwood."

According to estimates the lumber industry in the unit gave 264,000 man-days of employment or, in other words, part-time employment to about 5,000 men, assuming an average of about 50 days a year in the mills or woods. Habersham, Cherokee, Gilmer, and Whitfield Counties were important lumber-producing areas.

In addition to the sawmills, in 1936 there were, in descending order of importance in wood use, 3 cooperage plants, 1 veneer plant, and 3 dimension plants. (In addition, there are a few shingle mills, mostly small and cutting for local use; these are not shown in the forest industries map.) The veneer, of package type, is made from pines, yellow poplar, and gum. One of the cooperage plants makes slack cooperage from pine, while the other two make tight cooperage from white oak. All of the dimension plants cut shuttle blocks from dogwood; the shingle mills used pine. These non-lumber industries, together with the production of cross ties, poles, piles, and pulpwood, provided 86,000 man-days of employment, or part-time employment for over 1,000 men.

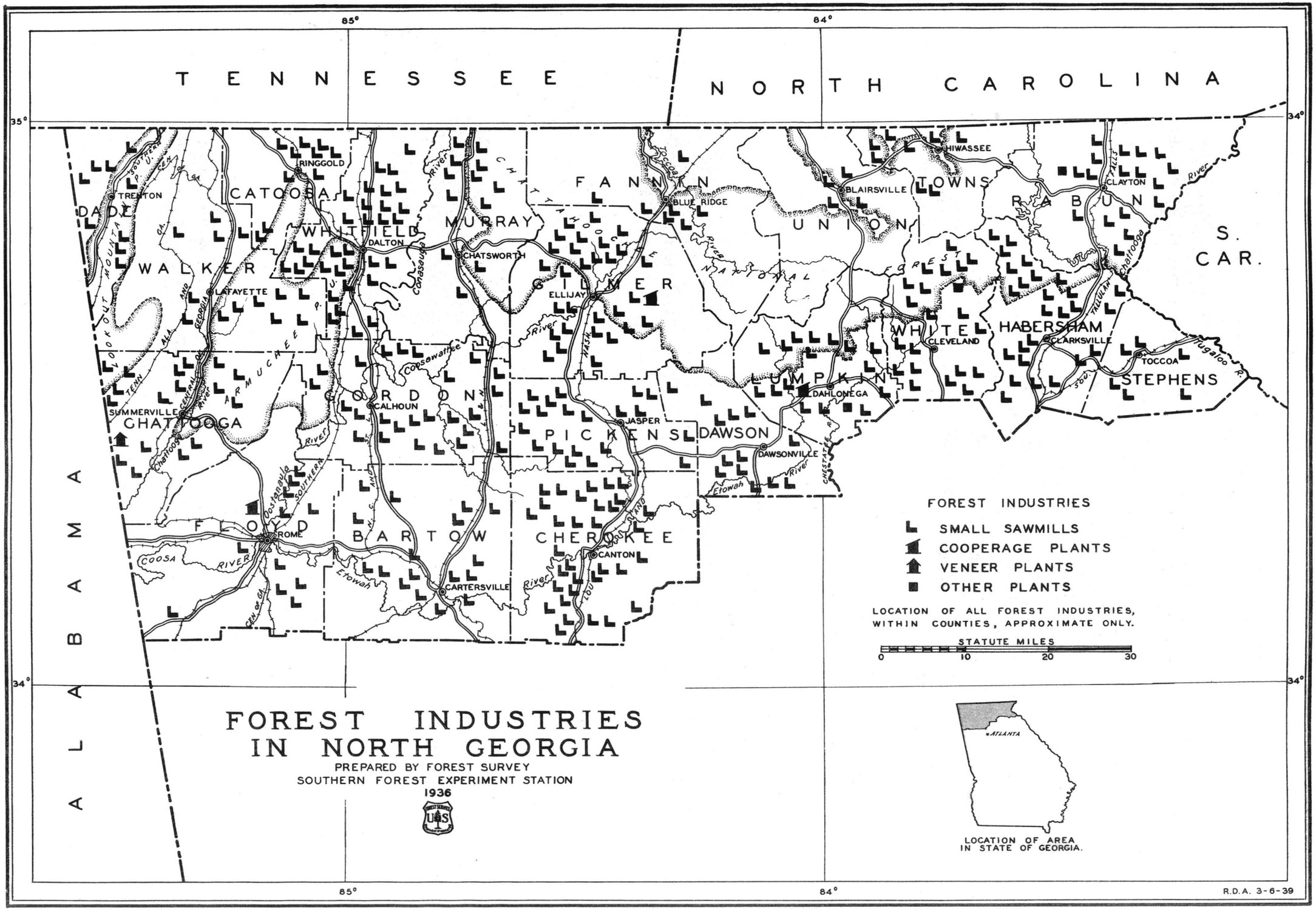


FIGURE 9.– FOREST INDUSTRIES MAP.

All forest industries combined furnished 745,000 man-days (10 hours each) of employment, but approximately half of this total was involved in the cutting of fuel wood and fence posts, chiefly for use on the farms (table 15). According to the Census of Agriculture for 1935, the farmers of this area worked one million man-days off their farms for pay; some of this labor was in the forest industries, chiefly the small sawmills.

Table 15. - Wood products and employment, 1936

Product	Units produced	Thousand man-days (10 hours) of employment		
		In woods	At plants	Total
Lumber	81,700 M board feet	102	162	264
Cross ties (hewn)	144 M pieces	22	-	22
Poles and piles	56 M pieces	13	-	13
Fence posts	1,260 M pieces	18	-	18
Pulpwood 1/	14,800 cords	15	-	15
Cooperage	6,400 cords	8	9	17
Fuel wood	761,100 cords	2/ 377	-	377
Miscellaneous (veneer, shuttle blocks, shingles, etc.)	2,400 cords	16	3	19
Total		571	174	745

1/ Entirely for pulp mills outside this area, since no pulp mill is within this unit.
2/ Not including a substantial amount of labor involved in salvaging 474,200 cords of fuel wood from waste, land clearing, and other sources.

Commodity Drain from the Growing Stock

The total volume of wood removed from the sawlog-size trees of the growing stock of this area for use in industry and for domestic purposes in 1936 was the equivalent of 143 million board feet. The commodity drain from all sound trees at least 5 inches d.b.h. was about 34 million cubic feet, inside bark (table 16), or 464,400 cords, including bark. This commodity drain, which does not include the losses due to mortality, is the growing-stock material removed for utilization, including the logs cut for shipment to mills outside the area and the waste incidental to the various logging operations. Material cut and utilized from the cull and dead trees, or from the upper stems and limbs of sawlog-size hardwoods, is not included.

Approximately 70 percent of the drain from saw-timber material comes from the pines; 30 percent comes from the hardwoods. Lumber, the largest single item, accounts for about two-thirds of the total, while fuel wood is second in importance.

Table 16. - Commodity drain from the sound-tree growing stock, 1936

Reason for drain	From saw-timber material			From all growing-stock material
	Species-group		Total	
	Pines	Hardwoods		
	- - - Thousand board feet (green lumber tally) - - -			Thousand cubic feet (inside bark)
Lumber	79,700	15,400	95,100	15,870
Cross ties	1,200	8,000	9,200	1,410
Poles and piles	6,100	-	6,100	1,140
Cooperage	1,500	3,100	4,600	690
Fuel wood	6,100	7,000	13,100	9,580
Fence posts	-	100	100	470
Pulpwood	1,100	100	1,200	990
Miscellaneous (including veneer, land clearing, and domestic farm use)	5,200	8,700	13,900	4,110
Total	100,900	42,400	143,300	34,260

The total commodity drain in cubic feet, inside bark, for 1936, is itemized in table 16 and allocated to the commodities for which the trees were cut. More growing-stock material, in trees 5 inches d.b.h. and larger, was cut for fuel wood (a commodity that should be cut from cull, scrub, and dead trees) than for all other non-lumber forest products combined.

Comparison of Increment and Drain

In 1937, the trees of the saw-timber part of the growing stock had a growth of 350 million board feet, which was reduced 66 million board feet by mortality, leaving a net increment of 284 million board feet. As the commodity drain for that year amounted to only 138 million board feet, there was a net increase in the growing stock of 146 million board feet (table 17). For the pines alone, the net increment was 2.4 times the commodity drain (fig. 10); for the hardwoods, 1.3 times; and for all species combined, the net increment was over twice the commodity drain.

For all growing-stock material in trees 5.0 inches and larger, including those of saw-timber size, the comparison of increment and drain shows a comparable surplus. In 1937 there was a net-increment balance of over 40 million cubic feet available for additional industrial or domestic usage and for building up the growing stock (fig. 11). This situation does not remain static but changes from year to year, varying largely with the demand for (and the prices of) lumber. It is estimated, however, that the lumber industry was more active in 1936 and 1937 than in any of the 5 preceding years. An idea of the magnitude of the surplus of growth over drain is given by the fact that in 1937 the

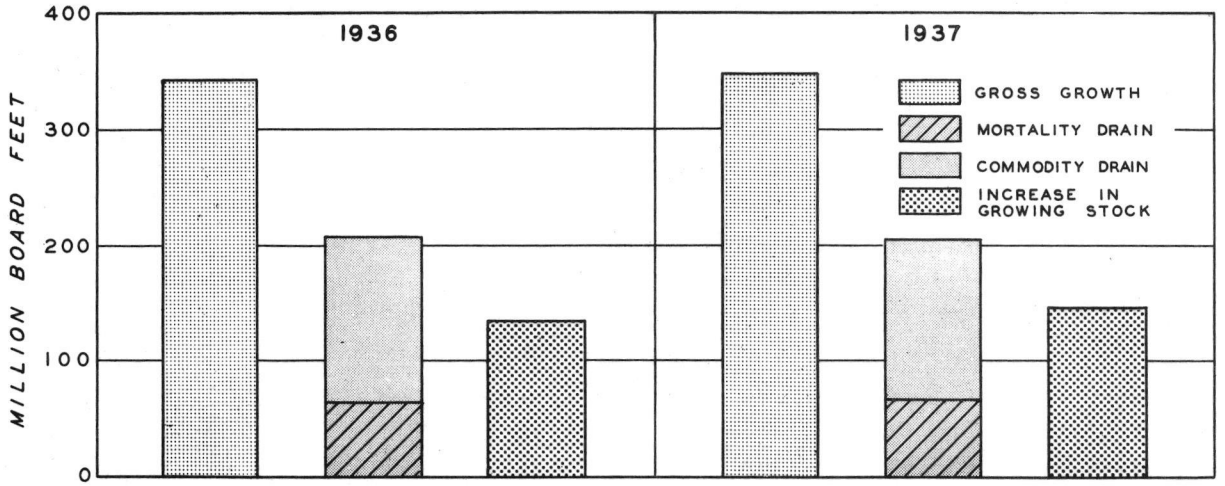


FIGURE 10 - COMPARISON OF GROWTH AND DRAIN FOR THE SAW-TIMBER COMPONENT OF THE GROWING STOCK.

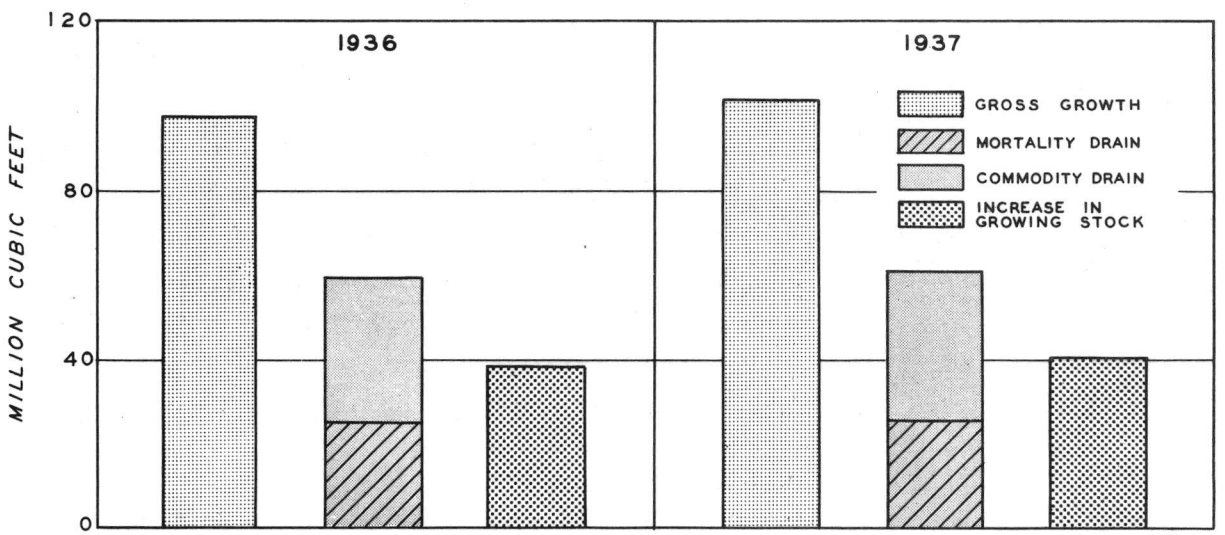


FIGURE 11. - COMPARISON OF GROWTH AND DRAIN FOR THE ENTIRE GROWING STOCK.

unused growth was sufficient to build almost 10,000 new 5-room houses; or, based on pine alone, more than enough to meet the requirements of 2 pulp mills.

Table 17. - Balance between net increment and commodity drain, 1936 and 1937

Item	Saw-timber material			All growing stock	
	Species-group		Total		
	Pines	Hardwoods		Outside bark	Inside bark
	Thousand board feet (green lumber tally)			Cords	Thousand cubic feet
Growing stock, Jan. 1, 1936	3,836,700	1,714,600	5,551,300	25,640,200	1,839,260
Growth	258,900	83,600	342,500	1,359,900	97,850
Mortality	34,000	29,900	63,900	354,800	24,980
Net increment	224,900	53,700	278,600	1,005,100	72,870
Commodity drain	100,900	42,400	143,300	464,400	34,260
Net increase in growing stock	+124,000	+11,300	+135,300	+540,700	+38,610
Growing stock, Jan. 1, 1937	3,960,700	1,725,900	5,686,600	26,180,900	1,877,870
Growth	265,600	84,300	349,900	1,392,200	101,770
Mortality	35,300	30,300	65,600	361,900	25,480
Net increment	230,300	54,000	284,300	1,030,300	76,290
Commodity drain	97,900	40,700	138,600	481,000	35,470
Net increase in growing stock	+132,400	+13,300	+145,700	+549,300	+40,820
Growing stock, Jan. 1, 1938	4,093,100	1,739,200	5,832,300	26,730,200	1,918,690

Notwithstanding the large amount of material that might be used to expand industrial activity in the near future, it would be to the lasting advantage of the region to leave a considerable part of the surplus growth in the stands to build up the quantity and quality of the growing stock in order to provide for even greater expansion as time goes on.

Summary of the Forest Situation

North Georgia, a mountainous area with many steep slopes and much soil erosion, especially on cleared land, has a total area of $4\frac{1}{4}$ million acres, of which 2-3/4 million acres are forest land. Of the total forest area, 54 percent is in farm woodlands, 25 percent is in other privately owned forests, and 21 percent is in publicly owned forest (mostly in the Chattahoochee National Forest).

Shortleaf, loblolly, and other pines, along with red and white oaks, are the principal species. About 88 percent of the forest is second growth. Most of the trees are small; the 2-inch and 4-inch diameter-classes include more trees than all others combined. Most of the pine stands are less than 60 years old; most of the hardwood stands are somewhat older. The timber-producing capacity of the unit, as shown by the large proportion of poor sites, is generally less than in the two comparable Survey units to the south of it. Owing largely to the common occurrence of fire, the forest stands are generally so poorly stocked that their volumes are only a fraction of those found in the most-heavily stocked stands.

The forest inventory of more than $5\frac{1}{2}$ billion board feet of saw timber shows that most of it is in trees near the minimum size and lowest quality accepted by lumber and veneer manufacturers, but more than four-fifths of it is in stands having 2,000 board feet or more per acre. Considering all sound usable material in live trees 5 inches d.b.h. and over, the volume is 35 million standard cords of rough wood, including over 7 million cords in cull trees. About 42 percent of the cordwood volume is pine, 9 percent is pulping hardwood, and 49 percent is nonpulping hardwood. Over two-thirds of the pine cordwood and about half the hardwood is in trees less than 13 inches d.b.h., not including the tops and limbs of sawlog-size hardwoods and the culls. Included in the inventory are $10\frac{1}{2}$ million trees from which poles and piles may be manufactured.

In 1937, the growth amounted to 350 million board feet, but mortality approximated 66 million board feet, leaving a net increment of 284 million board feet. For the entire growing stock (all sound trees 5 inches d.b.h. and larger, including those of sawlog size), the net increment was 1 million cords, bark included.

The relatively poorly developed forest-products industries include 346 sawmills, all with capacities of less than 20,000 board feet per day, and a few other small forest-products plants. In 1936, the commodity drain for industrial and domestic use, from saw-timber material in trees of sawlog size, was 143 million board feet; from both saw-timber and non-sawtimber material in growing-stock trees 5 inches d.b.h. and larger, it was 464,400 cords.

The net increment exceeded the commodity drain by 135 million board feet, or more than $\frac{1}{2}$ million cords. This margin of forest income over withdrawals is sufficient to justify the expansion of forest industries in this area. Good forest management will be necessary to develop the poorly stocked forest stands if that higher degree of productivity of which the soils are capable is attained.

Measures necessary to improve the situation

The people of north Georgia always have been directly dependent for their livelihood upon the products of their fields and forests. In the northeast part of this area, there has developed a self-sufficing farm economy, in which corn, hogs, fruit, and truck crops are grown, largely for home consumption, while lumber, railroad cross ties, and other forest products are depended upon for the cash income. In most of the remaining parts of this unit, the cash income is supplied by cotton, supplemented by work in the forest. In the entire area during 1934, over one million man-days of employment furnished farmers by forest activity outside their individual farms supplemented the meager returns from cotton and corn. In addition, the woodlands furnished farmers fuel wood, fence posts, and building material.

North Georgia needs additional opportunities for employment. Between 1909 and 1934 the cotton acreage declined over 23 percent, and preliminary figures indicate that from 1934 to 1938 the value of the crop has declined almost 2 million dollars, or about one-third. Since cotton has been the principal cash crop of the area, other income-producing possibilities must be developed. The special Unemployment Census taken in November 1937 disclosed that in this Survey unit there were about 12,000 people either unemployed and wanting work or on relief, and 8,000 partially employed and wanting more work.

Almost 2 out of every 3 acres is forest land, and this ratio is increasing; according to the Census of Agriculture, the acreage of farm woodland increased 23 percent from 1924 to 1934. Another indication that forest acreage is increasing is the fact that in 1936 the Survey found 240,800 acres of idle or abandoned cropland, much of which will revert to forest unless cotton prices go up. Before the expanding forest area can contribute fully to the welfare of the people, however, good forest management practices must be adopted and better and more diversified markets must be developed. A widespread and intensive campaign of forestry education is a prerequisite to the adoption of good forest management on privately owned forest lands throughout north Georgia.

Organized fire protection has long been practiced on the National forest, and more recently five counties—Chattooga, Floyd, Bartow, Cherokee, and Gilmer—have adopted county-wide forest-fire protection, under the supervision of the State Forest Service, according to the provisions of the Clark-McNary Act. If the benefits of good forest management are to be realized, fire protection, possibly on a county-wide basis, as encouraged by a recent act of the Georgia Legislature, must be extended to all unprotected parts of the unit.

Stand-improvement cuttings, wherever economically possible, are recommended to raise the quality and increase the growth of the present deficient forest stands. Cull and undesirable trees should be removed from the stands and, whenever practical, utilized for pulpwood, for extract wood, and for fuel wood, fence posts, and other domestic farm uses. Approximately 2 million cords of usable wood in blight-killed chestnut trees should be salvaged at an early date in order to save much of its cash value, to make room for an increased growing stock, and to lessen the fire hazard caused by its presence.

Selective-logging practices, designed to remove the over-mature slow-growing and surplus trees in all merchantable diameter-classes would greatly improve both the growth rate and the quality of the growing stock. As a general rule, cuttings should be light and as frequent as economic conditions will permit. The volume removed at one cutting ordinarily should not be greater than the net increment expected before the next cutting, and every effort should be made to build up the growing stock. Also thrifty utilization of the trees cut should be followed in order to recover all the usable material and to obviate the present wasteful practices of cutting high-quality saw timber into low-priced commodities, e.g., fuel wood and pulpwood.

A greater and more diversified demand for forest stumpage, either by existing forest industries or by new ones, such as are developing in south Georgia, would greatly stimulate and encourage landowners to protect and develop their forests. At the present rate of growth, the annual increment can and should support a greater forest-products industry, the ultimate size and character of which should be determined largely by the improved capacity of the increment to support it and by the kind and quality of the stumpage produced. Additional forest-products plants capable of using low-grade material are needed. Hardwood dimension-stock mills and chemical plants that could provide a market for some of the tremendous volume of low-grade hardwood would be helpful. No pulp mill is located in this unit, although such a mill could find here adequate wood supplies without undue competition with other industries, provided it took a large part of its wood from low-grade hardwoods and pines. A typical pulp mill would involve an investment of about 6 million dollars, would create a market for about 150,000 cords of wood annually, and would provide year-round employment for about 1,700 people in the mill and woods.

Much of the forest land has such a low productivity or is in such a depleted condition that private owners can hardly be expected to develop fully its forestry possibilities. At the same time, the proper management of the forest resources is essential (1) to increase the productivity of forest land and thereby meet the future wood requirements of expanded forest-products industries, (2) to preserve the scenic values of this important recreational area, and (3) to maintain a forest cover on the steep slopes for watershed protection. For these and other reasons, the public must play an important part in improving the forest situation in north Georgia. This it may do in part by encouraging and assisting private forest landowners to practice good forest management and in part by increasing the area of publicly owned and managed forest lands.